

# Claims

[c1] What is claimed is:

1. A method for analyzing in-line quality control (QC) test parameters, the method being used to analyze a plurality of lots of products, each lot of products comprising a lot number, the products being formed using a plurality of equipments, at least one wafer of each lot of products being tested by at least one in-line QC test item to generate an in-line QC test parameter, the in-line QC test item, and its sample test item and wafer test item being stored in a database, the database further storing the in-line QC test parameter and data of a plurality of lots of high-yield product stocks, such as test items and test parameters, the method comprising:
  - analyzing the in-line QC test parameter to determine whether the in-line QC test parameter corresponds to a predetermined spec or not;
  - searching the database to find out the sample test item or the wafer test item related to the in-line QC test item when the in-line QC test parameter does not correspond to the predetermined spec;
  - searching the database to find out the corresponding test parameters of the high-yield product stocks accord-

ing to the in-line QC test item and the searched sample test item or the wafer test item; and generating a correlation to illustrate the relationship between the in-line QC test item and the sample test item, or the relationship between the in-line QC test item and the wafer test item according to the searched high-yield product stocks.

- [c2] 2. The method of claim 1 wherein the lots of products are not tested by a sample test process and a wafer test process.
- [c3] 3. The method of claim 1 wherein the correlation between the in-line QC test item and the sample test item, and the correlation between the in-line QC test item and the wafer test item are generated using linear regression methods.
- [c4] 4. The method of claim 1 further comprising:  
predicting the sample test result of the lots of products according to the in-line QC test parameter not corresponding to the predetermined spec, and according to the correlation between the in-line QC test item and the sample test item.
- [c5] 5. The method of claim 1 further comprising:  
predicting the wafer test result of the lots of products

according to the in-line QC test parameter not corresponding to the predetermined spec, and according to the correlation between the in-line QC test item and the wafer test item.

- [c6] 6. The method of claim 1 wherein the database stores data of a process step related to the in-line QC test item, and the method further comprises:
  - classifying the lots of products into two groups according to a first spec, the two groups of products comprising a qualified group of products corresponding to the first spec, and a failed group of products not corresponding to the first spec;
  - searching the database to find out the process step related to the in-line QC test item;
  - finding the equipments used in the process step according to the lot numbers of the two groups of products;
  - and
  - determining the equipment through which a probability that the failed group of products have passed is higher than a probability that the qualified group of products have passed.
- [c7] 7. The method of claim 6 wherein commonality analysis is used to determine the equipment through which a probability that a low-yield group of products have passed is higher than a probability that a high-yield

group of products have passed.

- [c8] 8. The method of claim 1 further comprising:  
searching test results of each of the sample test items  
and each of the in-line QC test items of the lots of prod-  
ucts after a sample test process of the lots of products;  
and  
generating a correlation between each of the sample test  
items and each of the in-line QC test items according to  
the searching results.
- [c9] 9. The method of claim 8 wherein the correlation be-  
tween each of the sample test items and each of the in-  
line QC test items is generated by a multiple regression  
model.
- [c10] 10. The method of claim 8 wherein the correlation be-  
tween each of the sample test items and each of the in-  
line QC test items is generated by a stepwise regression  
model.
- [c11] 11. The method of claim 8 wherein the correlation be-  
tween each of the sample test items and each of the in-  
line QC test items is illustrated by a residual plot.
- [c12] 12. The method of claim 1 further comprising:  
searching test results of each of the sample test items  
and each of the in-line QC test items of the lots of prod-

ucts after a sample test process of the lots of products; classifying the lots of products into a plurality of groups according to the parameters of each of the in-line QC test items of the lots of products; analyzing the sample test parameters of each group of products; and analyzing and obtaining the group of products having the sample test parameters most similar to a second spec when the sample test parameters of the groups of products are different.

- [c13] 13. The method of claim 12 wherein an ANOVA method is used to analyze whether the sample test parameters of the groups of products are different or not.
- [c14] 14. The method of claim 12 wherein a Duncans multiple range test is used to analyze and obtain the group of products having the sample test parameters most similar to the predetermined spec.
- [c15] 15. The method of claim 12 wherein the classified lots of products are illustrated by a box plot.
- [c16] 16. The method of claim 12 wherein each of the in-line QC test parameters of the obtained group of products is used as a predetermined spec of the subsequent products.

